

## Description

# METHOD OF PLAYING BOARD GAMES ON TWO-DIMENSIONAL MANIFOLDS

### COPYRIGHT STATEMENT

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### BACKGROUND OF INVENTION

[0002] In mathematics a manifold is a locally-Euclidean space; this invention is limited to two-dimensional manifolds. These manifolds can be thought of as surfaces built from flat pieces by gluing them together along their sides. See [2], [8] for definitions. Moebius tape, torus, Klein bottle are examples of such surfaces (see [1]).

[0003] Patents 6595519, 6305688, 6318726, 6382626, 6491300 deal with puzzles that use Moebius topology. The current invention relates to playing board games on such a surfaces as well as other possible two-dimensional surfaces.

[0004] Patent 4,026,557 relates to a group of games around Taurus game, that use the surface of torus to map its

"oblique endless paths".

[0005] One of possible games in Renju (see [4],[5] for the game rules), another is gomoku, or 'five in line' (see [6], [7] for the game rules). The game 'five in line' (add the reference) is played on a two-dimensional board consisting of a rectangular grid of square cells. The game is played by two players (one uses 'crosses' and the other using 'zeroes' that in turn make their moves by drawing a 'cross' or a 'zero' in a cell that was not previously occupied by a 'cross' or a 'zero'. The player that manages to have five adjacent 'crosses' or 'zeroes' in line, horizontal, vertical or diagonal, wins.

#### **SUMMARY OF INVENTION**

[0006] Board games can be played on virtual boards that are mapped to two-dimensional surfaces like cylinder, torus, Klein bottle, etc, with the necessary alteration of the rules. Such games can be played on computers or other digital devices, including game devices. In this case the edges of the board are thought of as glued according to the gluing rules; the board can be scrolled on the screen, depending on how it is glued.

#### **DETAILED DESCRIPTION**

[0007] Usually board games are played on a limited (defined as compact in mathematics) piece of flat surface. Instead, the same games could be played on other surfaces e.g. a cylinder, a Moebius tape, a torus, a Klein bottle. While some of these surfaces can be physically constructed from a piece of flat material, others can be only modeled in a computer or on a flat board, if we define which sides should be imagined as glued together.

[0008] For instance, to produce a cylinder (a) from a chess board, one has to glue A1 to H1, A2 to H2, etc., and A8 to H8. There is no necessity to actually do it, but the rules ought to be changed to take into account this imaginary gluing. This virtual gluing can be easily visualized on a computer. To produce a Moebius tape (b), one has to glue A1 to H8, A2 to H7, etc., and A8 to H1. For torus (c), one has to take a cylinder (a), and glue together A1 and A8, B1 and B8, etc., and H1 and H8. For Klein bottle (d) one has to take a cylinder (a), and glue together A1 and H8, B1 and G8, etc., and H1 and A8. This cannot be done in actual reality, but can be easily modeled on a computer or in the game rules.

[0009] Board games such as "renju" or "five in line" can be played on such surfaces. The recommended minimal size of the

surface for "five in line" is 6 by 8, which is very practical for cell phones or PDAs. Both torus and Klein bottle surfaces can be used to play this variant of 'five in line'.

[0010] A computer program, or a device ("apparatus") can model any such game board surface and display it on the screen as if it were a flat surface with borders glued together according to the nature of the surface. If the board does not have boundaries, e.g. a torus or a Klein bottle or a projective plane, it can be panned or rotated on the screen, so that different cells move to the center of the screen. Moebius tape may be rotated on the screen only in one dimension (left-right).

[0011] *References*

[0012] 1. [http://en2.wikipedia.org/wiki/Klein\\_bottle](http://en2.wikipedia.org/wiki/Klein_bottle)

[0013] 2. <http://en2.wikipedia.org/wiki/Manifold>

[0014] 3. Rupert Matthews, "The Game Mania", Silver Dolphin, 2002, ISBN 1571457070

[0015] 4. <http://boardgames.about.com/cs/historiesnr/>

[0016] 5. <http://www.gamerz.net/pbmserv/renju.html>

[0017] 6. <http://www.gamerz.net/pbmserv/gomoku.html>

[0018] 7. <http://www.gamerz.net/pbmserv/pente.html>

[0019] 8. R.Curant, H.Robbins, I.Stewart, "What Is Mathematics",  
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